

FIG. 1

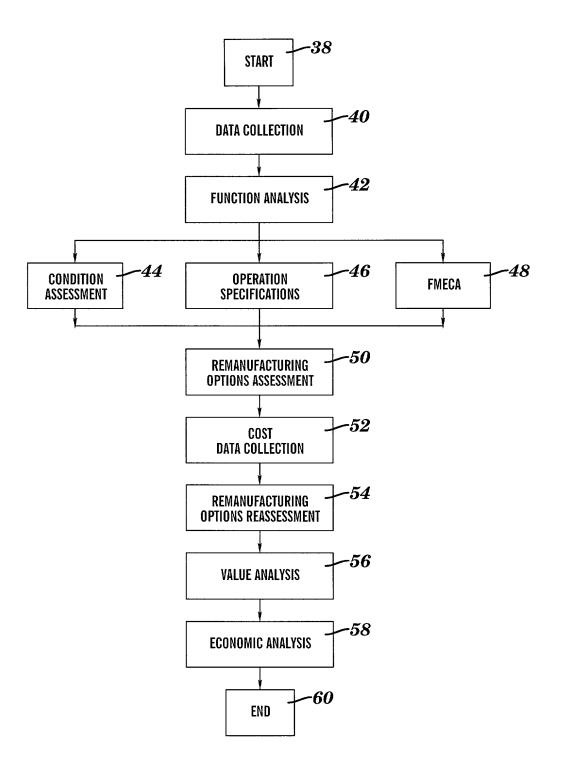


FIG. 2

3/22
DATA AVAILABILITY MATRIX

			2.0						77	N.C.	t e
System Hierarchy	Failure 109	Memmed	System Map/Drawings	Furrefield	ogeds MgO	saeds remoteno	Technology upgrade	Condition Assessment	New Cost	Ovatra Missiffic Country	Percent of data
CHANICAL										1017	
oulsion										186	3
Drive MTU (port)		1									
Mounting	×	×	×	•	×	×	*	•	<u> </u>		
Remote control from the bridge			•	•	×				A		
Enclosed operator space controls		1		•	×			•	A		
Local controls			•	•	*			•	A		
Exhaust	_	×	×	•	×			•	A		↓
Ignition			×	•					A		
Air intake		×	×	•	×			•	A		
Reduction gearing		T	×						A		
Water seal		×	•	•				•	A		
Drive shaft		×	•	•				•	Λ		
Turbocharger		T						•	A		
Salt water cooling		×							Α_		
Fuel oil system		×						•	A		
Engine coolant pre-heater			•					•	A	<u> </u>	
Drive MTU internal air compressor									A		
Hydraulics								•	A		
Engine block components		×		¢					A		
Drive MTU (starboard)											
Mounting	*	×	×		×	×	×	•	A		
Remote control from the bridge			•	•	×			•	A		
Enclosed operator space controls				•	×				A		
Local controls			•	•	×			•	A		
Exhaust		×	×	•	×			•	A		_
Ignition			×			<u> </u>			A		-
Air intake		×	×		×			•	A		
Reduction gearing			×	•	•			•	A	 	
Water seal		×	•	•				•	A	<u> </u>	
Drive shaft		x	•	•				•	A		
Turbocharger				•				•	A		
Salt water cooling		×						•	A		
Fuel oil system		x			•			•	A		
Engine coolant pre-heater		•	•		•			•	A		
Drive MTU internal air compressor				•				•	A		
Hydraulics				•		<u> </u>		•	A		
Engine block components		×		•				•	A		
KaMeWa jet (port)						4-				 	
Hydraulic powerpack			•	•				•	A		_
Hydraulic lines		х		•				•	A		_
Electric heater		y	×	•				•	A		
Jet nozzle			•						A		
Jet pump		•	•						A		
KaMeWa jet (starboard)											_
Hydraulic powerpack								•	Ą		
Hydraulic fines			x 9					•	A		1_

FIG. 3

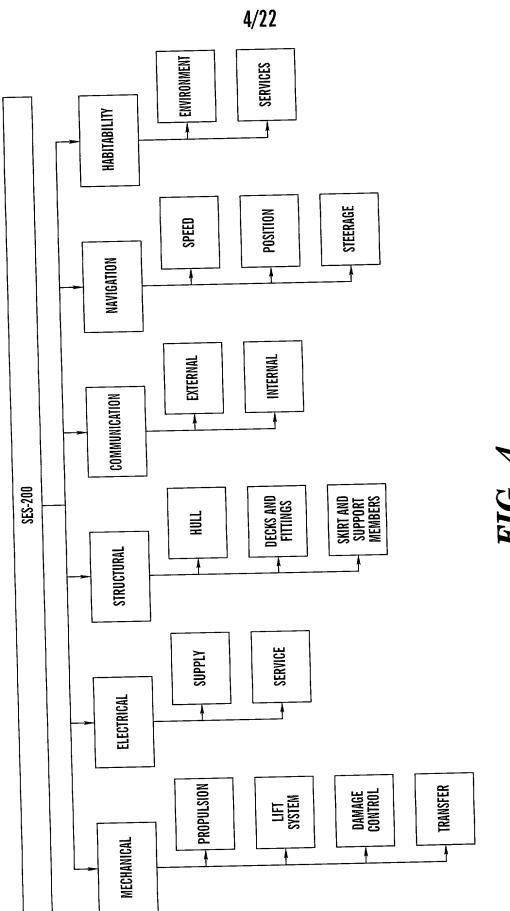


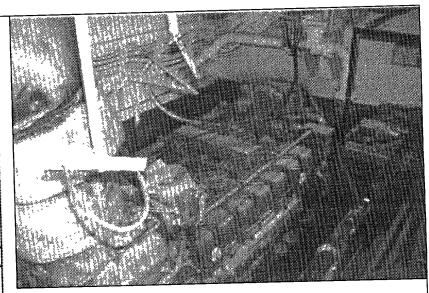
FIG. 4

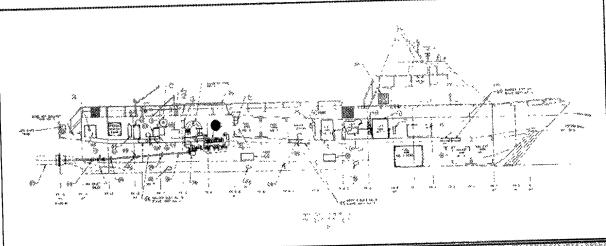
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FUNCTION MATRIX

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Secondary function	en e	10000000000000000000000000000000000000	HAMMANANAN AND AND AND AND AND AND AND AND A		THE RESIDENCE OF THE PARTY AND ANALYSIS OF CONTROL OF C
Primary Function		Daiver torque to port Kalle Wa wateriet purity	Secure engine to ship training to prove the provide the particles of the particular pa	Provide Intelests to Collision Bright Control of Propries	Drynde local control of engine turchous
 | | A District Constant Di | Provide compressed air for engine future. In Kalletina hydraul o back | | Conversion to examinate KaMeWe wateriet pump | Coo no andine to ship framing to prevent movement and vibration
 | Prounds means to control engine from bridge for navigation (prigodes | Provide for centralized monttoring and control of engines. | Provide local control of engine functions | Expel combustion gases to exterior of shift | Provide means for engine staff up | Transfer at to end the following the contraction of the contraction | Peduce RPMs to KMW 888 to prevent carrieran | Provides Seal Detween Jing Stat and Dairy over
 | Down action Prints | Provide cooling to engine, exhaust and reduction gearing | Provide hel of to engine | Heat engine codent during extreme weather to prevent resecting | Provide compressed an for engine functions | Provide hydrautic prossure for entains himself and provided energy | Convert chefficial effectly Little Unit to those engines to propulsiary to the | COLOGICAL LANGE OF TRANSPORT WAS TRANSPORTED TO THE PROPERTY OF THE PROPERTY O | Transfer Pyddaulic pressure from powerpant to watenet
 | Maintain ambient temperature around lefs | Provide means of directing waterfrow for steering reversing | Output seawater under pressure to provide propulsary forces | Convert torque supplied by sthd drive engine to propulsary force | Provide hydraulic pressure for wateriel manipulation | Transfer hydrautic pressure from powerpack to warmier | Maintain anthent temporature around lets
 | Provide means of directing waterlook for streeting lovers and | Output seawater under pressure to Presure proximent in the | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| m Element | | CONTROL OF THE PROPERTY OF THE | | Hamole control from the bridge | Enclosed operator space controls | Local controls | EXPRISE | 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1 | Reduction gearing | Waler sea! | Drive straft | Taboan | Call Water Charlet | English on Mark Steel Steel | Drive MTU internal air corr pressor | Hydrauss | Engine block components | ANALOS TOCONOSCOU UN CONTRACTOR C | Mounting | Remote comfor from the Dilugal | Enclosed operator space connicia | LOCAL COUNTY STATEMENT OF THE STATEMENT | \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | \$ 15.5 (\$18.2) \$ 1.5 (\$1 | Particion dealth | Water sea | Chwe shaft | Turbocharget | Saf water cooling | 7 US 08 BYSICH | Dryc MTU nternal air compressor | | Engine block combonents | ************************************** | Hydraulic powerpack | Hydraukt knes | Electric healer | (et nozzie | JRI (24318) | DA CONTRACTOR AND MONICONTRACTOR | The of the party o | Flactic beater | 128.130.180.180.180.180.180.180.180.180.180.18 | Set Mitto |
| System Subsystem | MECHANICAL | | Drive MTU (port) | | And the state of t | A STATE OF THE PARTY OF THE PAR | 9, , 3 | | | The state of the s | CANADOTO()(A)(A)(A)(A)(A)(A)(A)(A)(A)(A)(A)(A)(A | ACONOMICA PRODUCT - SECRETARIA SE | | | The state of the s | VIV. DEL CONTROL DE LA CONTROL | The state of the s | Dryp MTU (statioard) | | | an anna consecutations | | *************************************** | | | Garage Control of the | ALC VINNORMAN CONTROL OF THE PROPERTY OF THE P | | *************************************** | TO THE REAL PROPERTY OF THE PERSON OF THE PE | WWW. V | | *************************************** | Water State | ************************************** | *************************************** | | NAJAMOTETETETETETETETETETETETETETETETETETETE | | Kamewa jet (Starteard | | | *************************************** | |

ESWBS
23310
Function Group
Lillicitoit Airach
MECHANICAL
System
Propulsion
Subsystem
Drive MTU
Item description
Drive MTU port





Frame location:	\$	hip location:
8-6 to 8-10	· · ·	11) Port
Manufacturer:	Model #:	Part #: Serial #:
Detroit Diesel	MTU 16V-396 TB94	559-0477
Candidon		

Condition:

Mounting, Remote control from the bridge, Enclosed operator space controls, Local controls, Exhaust, Ignition, Air intake, Reduction gearing, Water seal, Drive shaft, Turbocharger, Salt water cooling, Fuel oil system, Engine coolant pre-heater, Aux drive MTU air compressor, Hydraulics, Engine block components, *Operating hours meter = 1930.68 hrs *Turbo rusted *Slight corrosion or other surface damage *Air intakes missing *Water buildup in drive shaft compartment *Coolant manifold severely cracked * Large coupling on drive shaft (FR 13) corroded *Wt. = 6685 kg *2560 kW *2150 RPM *Sea water cooling fitting to reduction gear cracked *See detailed report from Florida Detroit Diesel-MTU for more information

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System Hierarchy	MECHANICAL	Propulsion	Drive MTU (port)		Enclosed operator space controls	Local controls	Exhaust	Control	Air intake	Reduction gearing	Water seal	Drive shaft	Turbocharger	Sali water cooling	Fuel oil system	Engine coolant pre-heater	Drive MTU Internal air compressor		DOUBLE	Drive MTU (starboard)			Enclosed operator space controls	ntrols	Exhaust	lgnition	Air intake	Reduction gearing	Water seal	Drive shart
	Seized/ Fractured/ Corrosion Corrosion Corrosion Corrosion Corrosion Severe Corrosion Missing Missing Missing Corrosion Corrosion Corrosion Corrosion Corrosion Corrosion Missing Corrosion Corrosion Corrosion Missing Corrosion Corrosion Missing Corrosion Corrosion Missing Corrosion Corrosion Missing Connected Connec	Fair Fair Fair Fair Fair Fair Fair Fair	Seized Fractured Corrosion Seepage Corrosion Excessive Corrosion Severe Corrosion	Sin Fair Fair	Sign Mounting Mounting Mounting Mounting Pants Control from the bridge Seepage Seepage Seepage Fuel Corrosion Seepage Parts Seep	SECTOR OF THE PRICE CONTROL OF	VSTED TIPE COTOSION Sign Missing Corrosion Severe Corrosion Severe Corrosion Severe Corrosion Seepage Parts Water Seepage Parts Water Seepage Parts Water Seepage Parts Water Seepage Fractured/ Cracked Fractured/ Mounting Remote controls Enclosed operator space controls Local controls	Stepage Seized Tocal controls Local controls Local controls Local controls Local controls Excessive Water Seepage Fuel Fractured Fr	VS COMPANY VS COMPANY Sign Dive MTU (port) Mounting Remote controls Corrosion Seepage Corrosion Seepage Corrosion Excessive Water Connected Connected Connected Connected Fractured Connected Fractured Connected Enclosed operator space controls Cocal controls Exhaust Cocal controls Exhaust Guition	VSTEM FIGURED VSTEM FIGURED Figure Figure	VSTEM TIETATCHY Sion Drive MTU (port) Mounting Hemore controls Excessive Corrosion Severe Corrosion Excessive Water Oil Corrosion Fruet Leakage Parts Missing Missing Hemore controls Expaust Local controls Expaust Ignition Air intake Reduction gearing	VSTORY VSTORY Sign Drive MTU (port) Mounting Remote controls Light Corrosion Seepage Corrosion Excessive Wear Water Fractured Poort Remote controls Local controls Local controls Expense controls Local controls Local controls Expense Reduction gaaring Water seal	VSTEM TIERATCHY Sign	Seized Mounting Remote controls Exhaust Exhaust Exhaust Mater searing Water searing	VS (em Tlefarchy In the bridge Fraction garing Water seal Drive shall gailton Air intake Heduction gearing Water Seal Drive shall rubocharger Sali water cooling Sali water cooling	SECTION Sign Drive MTU (port) Mounting Remote control from the bridge Enclosed operator space controls Enclosed operator space controls Exhaust Ignition Air intake Reduction gearing Water seal Uncal controls Exhaust Ignition Air intake Reduction gearing Water seal Unitake Reduction gearing Water seal Unitake Feduction gearing Water seal Unitake Feduction gearing Water seal Feduction gearing Water seal Unitake Feduction gearing Water seal Feduction gearing Feduction gearing Feduction gearing Feduction gearing Feduction gearing Feduction gearing	VSTEM TIETATION Drive MTU (port) Mounting Remote control from the bridge Enclosed operator space controls Extraction Extraction Local controls Extraction Local controls Extraction Local controls Extraction Air intake Reduction gearing Water seal Unbocharger Salivater cooling Fuel oil system Engine coolant pre-heater	VSTEM FIELZICHY sion Drive MTU (port) Mounting Remote control is must bridge Enclosed operator space controls Exhaust Gornosion Air intake Turbocharger Salt water cooling Fuel oil system Fuel oil system Drive MTU internal air compressor	VSTem Herarchy In Mounting Remote controls Enclosed operator space controls Enclosed operator space controls Local controls Exhaust Gritted Local controls Exhaust Gritted Leakage Mater saal Gritten Air make Reduction gearing Water saal Drive shaft Tubocharger Salt water cooling Fuel oil system Engine coolant pre-heater Drive MTU internal air compressor Hydraulics	VSTEM HIERATCHY Sion Drive MTU (port) Mounting Remote control Excessive Remote control Corrosion Excessive Remote control Corrosion Extra control Corrosion Extra control Extra control Extra control Extra control Extra control Extra control Ignition Arr intake Reduction gearing Water seal Unive shaft Tubocharger Engine coolant pre-heater Drive MTU internal air compressor Hydraulics Engine block components Engine block components	VS ICAM TICATORY Sion Drive MTU (port) Water seal Introduction End seal End seal	VS (em Figure 1) Nounting Mounting Facution grains Enclosed operator space controls Enclosed operator spa	VS (em Flerarchy Sion Drive MTU (port) Mounting	VSTEM TIETATCHY Blon Drive MTU (port) Mauriting Hamoric control from the bridge Enclosed Operator space controls	VS (em Lierarch) Drive MTU (port) Menution Menution	VS (em Lierarch) Sign Figure Fig	Signaturing Present of the bridge Particular of the bridge Particul	YS (em rice of the bridge of t	VS (Em Filed Chy Sein Filed Chy Sein Filed Chy Sein Filed Chy Sein Mounting Mare seen Turochings Fine Controls Controls Controls Missing Parts Missing Parts Missing Parts Missing Parts Missing Parts Missing	VS (EM FIGURE) Signature Mind Mounting

FIG. 7

OPERATION SPECIFICATION MATRIX

								
Operational Specification	MTU 16V396TB94, Liquid cooled. Four-stroke clessel engine, Anti-clockwise direction of rotation, High Performance Rating Class 1DS- Fast Vessels, Certification wiclassifiable power (0.909 x rated power) from all leading classification societies, Fuel Power Stop kW (mtp), 2580 (3482), Engine output: 3200 brip each. Speed RPM: 2150, Gearbox Model: BW 755 Free-standing, Transmission Ratio: 2.33 · 1, Bore/Stroke mm (m.), 165/185 (6 5/7.3), Total Displacement L. (in.); 83.4 (3866), Intake air temp. 25°C / Sea water temp. 25°C, 3.0% power reduction @ 45°C (air) / 32°C (water); 8685 kg weight	Flanges and conical rubber elements	Sheet-steel housing w/resilient mounts	Speed, Temperatures (coolant, raw water, charge sir, exhaust before turbme), Pressure (block, non-return valves, coolant & raw water tines), Fluid tevels	Exhaust gas turbo-charging	Electric slarter	Combustion air system- intake filter strainer w/attaching hardware	Valve crear and crear train. Behr BW755. Serial #219 (STRBD) #220 (PORT), Ratio 2.33 : 1
System Subsystem Element MECHANICAL	Propulsion Propulsion Drive MTU (port)		Remote control from the bridge Findosed operator space controls			กอสเกติ	Air intake	Reduction gearing

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FAILURE MODES, EFFECTS, AND CRITICALITY ANALYSIS (FMECA)

System	Subsystem	Function	Failure Modes	Cause
Propulsion	Drive MTU	Deliver torque to KaMeWa waterjet pump		
		Secure engine to ship framing to prevent movement and vibration	Mounting fails	Wear
				Corrosion
				Manufacturer's defect
		Provide means to control engine from bridge for navigation purposes	Remote control from the bridge fails	Power Failure
1		//		Circuit Interruption
		Provide for centralized monitoring and control of engines	Enclosed operator space controls fail	Power Failure
				Circuit Interruption
		Provide local control of engine functions	Local controls fail	Power Failure
				Circuit Interruption
		Expet combustion gases to extenor of ship	Exhaust fails	Obstruction
				Faulty Seal
				Damaged Piping
		Provide means for engine start-up	Ignition fails	Air System Failure
				Power Failure
				Circuit Interruption
		Transfer air to engine for combustion	Air intake fails	Obstruction
		Reduce RPMs to KMW jets to prevent cavitation	Reduction gear fails	Wear
				Corrosion
				Insufficient Lubrication
				Manufacturer's defect
		Transfer power from engine to KaMeWa waterjet pump (port)	Drive shaft fails	Wear
				Corrosion
				Load
				Manufacturer's defect
		Provides seal between drive shaft and bulkhead	Water Seal leaks	Wear
				Manufacturer's defect
		Boost engine power	Turbocharger fails	Wear
				Corrosion
				Manufacturer's defect
		Provide cooling to engine, exhaust and reduction gearing	Sait water cooling fails	Wear
		participation and the second s		Соновон
				Manutacturer's defect
		Heat engine coolant during extreme weather to prevent freezing	Kim HotStart Engine Coolant Heater fails	Power Failure
			/\ W//V	Electrical grounding

FIG. 9A

 $\begin{tabular}{ll} $10/22$ \\ \hline {\parbox{Failure modes, effects, and criticality analysis (fmeca)} \\ \end{tabular}$

Local Effect	Secondary Effect	Ultimate Effect	Detection	Sev	Freq	N d t
Excessive engine vibration/movement	Engine failure/orive train damage	Compromised propulsion to ship	Audible	7	3	21
Excessive engine vibration/movement	Engine failurerarive train damage	Compromised propulsion to ship	Audible	7	3	21
Excessive engine vibratron/movement	Engine foliure/drive train damage	Compromised propulsion to ship	Audible	7	2	14
Lass of engine control from bridge		Inability to remotely control engines	Operational Failure	4	3	12
Loss of engine control from bridge		Inability to remole'y control engines	Operational Failure	4	5	20
System fails to respond to controls from ECH	Loss of remote control of engine (from bridge)	Compromised propulsion to ship	Operational Failure	6	3	18
System falls to respond to controls from ECR	Loss of remote control of engine (from bridge)	Compromised propulsion to ship	Operational Failure	6	3	18
Total loss of engine control	Puneway engine	Catastrophic damage to engine/potential loss of life	Audible	9	1	9
Total loss of engine control	Runaway engine	Catastrophic damage to engine/potential loss of life	Audible	9	1	9
Excessive packpressure	Stall engine	Compromised propulsion to ship	Gaging	6	1	6
Exhaust blow-by	Air quality in ship compromised	Health hazard	Gaging/Visual	9	4	36
Exhaust blow-by	Air quality in ship compromised	Health hazard	Gaging/Visual	9	4	36
Engine will not start		Compromised propulsion to ship	Operational Failure	7	4	28
Engine will not start		Compromised propulsion to ship	Operational Failure	7	4	28
Engine will not start		Compromised propulsion to ship	Operational Failure	7	4	28
Reduced airflow to engine	improper combustion	Compromised propulsion to ship	Gaging	4	2	8
Gearbox/dnve shaft damage	No power transmission to KaMeWa	Compromised propulsion to ship	Visual	6	4	24
Gearbox/drive shaft carnage	No power transmission to KaMeWa	Compromised propulsion to ship	Visual	6	4	24
Gearbox/drive snaft damage	No power transmission to KaMeWa	Compromised propulsion to ship	Visual	6	5	30
Gearbox/drive shaft damage	No power transmission to KaMeWa	Compromised propulsion to ship	Visual	Ĝ	2	12
Bent/oroken drive shatt	No power transmission to KaMeWa	Compremised propulsion to ship	Visual	6	4	24
Benl/broken drive shalt	No power transmission to KaMeWa	Compromised propulsion to ship	Visual	6	4	24
BenVbroken drive shaft	No power transmission to KaMeWa	Compromised propulsion to ship	Visual	6	5	30
Bentrorokan drive shaft	No power transmission to KaMeWa	Compromised propulsion to ship	Visual	6	2	12
Seawater leakage	Ship's trim affected	Below deck water flooding	Visual	7	4	28
Sexwater leakage	Ship's trim affected	Below deck water/flooding	Visual	7	2	14
Ne boost	Decreased engine output	Reduction in engine efficiency	Gaging	3	4	12
No boost	Decreased engine autout	Reduction in engine efficiency	Gaging	3	5	15
No boost	Decreased engine output	Reduction in engine efficiency	Gaging	3	2	6
Engine/Gearbox-Exhaust Overheats	Engine failure	Compromised propulsion to ship	Gaging	6	5	12
Engine/Cearbox/Exhaust Overheats	Engine failure	Compromised propulsion to ship	Gaging	6	3	18
Engine/Gaarbox/Exhaust Overheats	Engine tailure	Comprehised propulsion to ship	Gagang	6	2	12
inability to preheat coolant at start-up	Potential thermal stressing	Engine failure/thermal cracking of engine block	Gaging	7	3	21
hability to praheat coplant at start-up	Potential thermal stressing	Engine failure/thermal cracking of engine block	Gaging	7	3	21

REMANUFACTURING OPTONS CRITERIA

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Remanufacturing Options		>	>	^	>		>	>					
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Condition	Far Poor					*	>	>	×	>	>	>	>
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FIG. 10

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REMANUFACTURING OPTIONS MATRIX

Legend:	Identifies option as a "best" poss Identifies option as a possible ch					
	Identifies option as not feasible i	in the remanufacturing process	;			
System	Sub- system	Element	Modity	Heuse	Replace	Remove
Propulsion						
**************************************	Drive MTU (port)					
*******************************	Mounting					
~	Remote control fro	om the bridge				
	Enclosed operator	r space controls				
······································	Local controls					
~~~~~	Exhaust					
······································	Ignition					
Acusanos apusas esta esta esta esta esta esta esta e	Air intake					
·····	Reduction gearing	1				
on a successive de conscionaries de cons	Water seal					
······	Drive shaft					##\Y
	Turbocharger					
	Salt water cooling					
	Fuel oil system		<u> </u>			
	Engine coolant pr	e-heater				
	Drive MTU interna	al air compressor				
	Hydraulics		3 , 3			
	Engine block com	ponents				
	Drive MTU (starboard)					
	Mounting					
	Remote control from	om the bridge	(			
	Enclosed operato	r space controls				
*****************************	Local controls					
***************************************	Exhaust		3 , 3			
**************************************	lanition					

FIG. 11

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	2		Reman Definitions		Fet			7				77	6778	733	phil_wasinger@daimlerwa	Source haterence Request for Quidation	G	1	the price quate is per engine and includes contras, monitoring systems and engine cousars in e- hexer(\$687,300). Formore the current air inlet heusing and move to side of half or area beland the			2 8	
	gota Technical feasibility		n Defi					Ì			Phil Wasinger	700	(+1.202) 414 6778	(+1.202)4146773	vasinge	st for Q	Outlien		angine c ultor ac				
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FIG. 12

**COST AVAILABILITY MATRIX** 

= NEED MORE INFORMATION TO PROCEED = ABLE TO LOOK FOR REMAN COSTS = IN THE PROCESS OF GETTING COST INFORMATION = NEED THE REMOVAL COST

= DATA NOT REQUIRED = DATA COLLECTED

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#### FIG. 14A

Exercise 1			**********		***********
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### FIG. 14B

#1: REPLACE MTU engine REPLACE Kim Hotstart w/ internal unit	ES REPLACE Kim Hotstart w/ new unit	RESTORE Kim Hotstart
	REQUIRES	**************************************
Scenario #1: REPLACE MTU engine	Scenario #2: RESTORE MTU engine	RESTORE MTU engine
Scenario #1:	Scenario #2:	Scenario #3:

### FIG. 14C

PAIRED COMPARISON MATRIX Determining Weights for Value Analysis

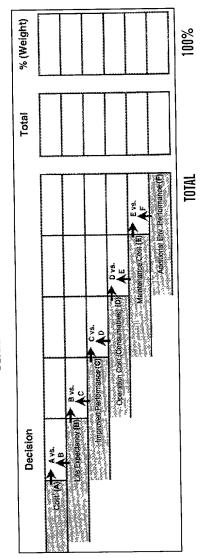


FIG. 15

PAIRED COMPARISON MATRIX DETERMINING WEIGHTS FOR VALUE ANALYSIS

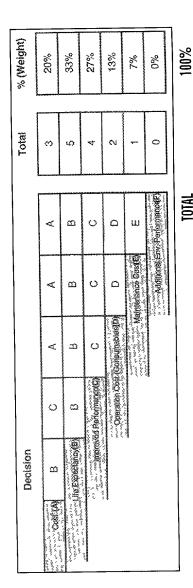


FIG. 16

Replace Reman Option	% (Weight)	Ratings
Cost (A)	20%	**
Life Expectancy (B)	33%	4
Improved Performance (C)	27%	~
Operation Cost (Consumables) (D)	13%	ന
Maintenance Cost (E)	7%	7
Additional Env. Performance (F)	%0	ಣ

### FIG. 17A

Restore Reman Option	% (Weight)	Ratings	
Cost (A)	20%	က	
Life Expectancy (B)	33%	4	
Improved Performance (C)	27%	co.	
Operation Cost (Consumables) (D)	13%	ന	
Maintenance Cost (E)	7%	₹\$	
Additional Env. Performance (F)	%0	ಣ	
**************************************	***************************************		,

### FIG. 17B

Renlace Reman Option	% (Weight)	Ratings	Score
Cost (A)	20%	4	0.80
Life Expectancy (B)	33%	4	1,33
Improved Performance (C)	27%	4	1.07
Operation Cost (Consumables) (D)	13%	ဗ	0.40
Maintenance Cost (E)	7%	*	0.27
Additional Fnv Performance (F)	%0	က	0.00

#### 7IG. 18A

3.87

Restore Reman Option	% (Weight)	Ratings	Score
Cost (A)	20%	8	09'0
Life Expectancy (B)	33%	4	1.33
Improved Performance (C)	27%	3	0.80
Operation Cost (Consumables) (D)	13%	ဗ	0.40
Maintenance Cost (E)	7%	4	0.27
Additional Env. Performance (F)	%0	တ	0.00

### FIG. 18B

3.87

ı	% (Weight)	20%	33%	27%	13%	7%	%0	100%
Paired Comparison Matrix Determining Weights for Value Analysis - Main MTU Engine/Kim Hotstarı Sconarıo	Total	3	သ	4	7		0	in.
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<b>atrix</b> U Engine/Kim		A	8	ပ	a	Ш	o Performance(F)	Total
Paired Comparison Matrix ignis for Value Analysis - Main MTU Engin		X	ற	O	۵	interior Cost	Additional Env. Performance 5	
or Value Analy		*	m	O	poration Cost (Consumption ID)	Minerano Coste		
<b>Pai</b> ning Weights I		U	0		Operation Cast (Consume	. E		
Determi	Decision	B (W) (%) (%) (%) (%)			Control of the Contro			

FIG. 19

	% (Weight)	Ratings	Score
Sat S	20%	8	0.60
Life Expectancy (B)	33%	so.	18
Improved Performance (C)	27%	*	1.07
Operation Cost (Consumables) (D)	13%	*	650
Maintenance Cost (E)	7%	8	0.29
Additional Env. Performance (F)	%0	***************************************	83

%OA
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Scenario #2	% (Weight)	Ratings	Score
Cost (A)	20%	4	800
Life Expectancy (B)	33%	*	8
Improved Performance (C)	27%	8	0.80
Operation Cost (Consumables) (D)	3%	8	0.40
Maintenance Cost (E)	7%	က	0.20
Additional Env. Performance (F)	%0	60	800

FIG. 20B

		Tail G	Score
Cost (A)	%8	4	80
Life Expectancy (B)	33%	4	8
Improved Performance (C)	27%	6	88.0
Oneration Cost (Consumables) (D)	3%	8	0.40
Maintenance Cost (E)	7%	က	8,0
Additional Env. Performance (F)	8	8	0.00

FIG. 20C

#### 21/22

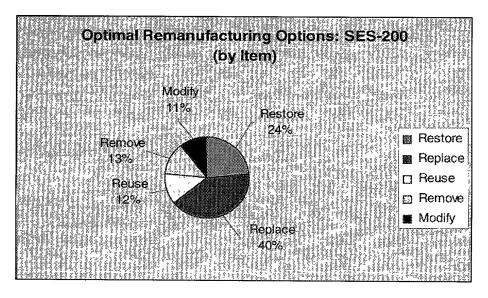


FIG. 21

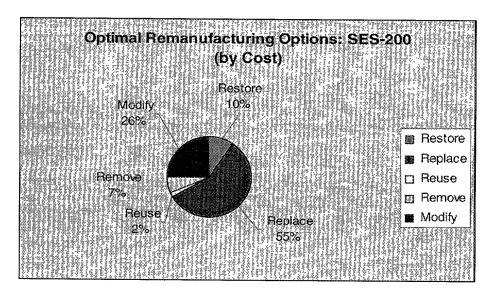


FIG. 22

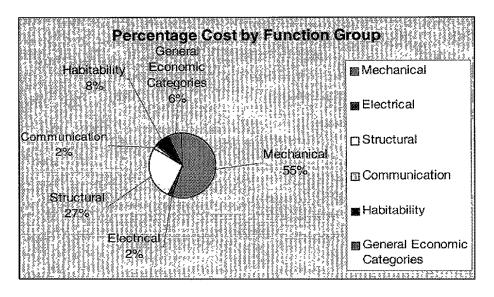


FIG. 23